UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/788,339	02/21/2001	Sadaji Tsuge	P107336-00018	1063

7590 08/21/2003

ARENT FOX KINTNER PLOTKIN & KAHN, PLLC
Suite 600
1050 Connecticut Avenue, N.W.
Washington, DC 20036-5339

EXAMINER	
MUTSCHLER, BRIAN L	

ART UNIT	PAPER NUMBER
1753	

DATE MAILED: 08/21/2003

14

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/788,339	TSUGE, SADAJI	
	Examiner	Art Unit	
	Brian L. Mutschler	1753	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 July 2003* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-8* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-8* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *18* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

Comments

1. The rejections of claims 1-8 under 35 U.S.C. 103, using Hanoka et al. (U.S. Pat. No. 6,353,042) as the primary reference, have been overcome by Applicant's amendment. Neither Hanoka et al. nor the other references relied upon in the rejection teach the formation of both electrodes as transparent electrodes, as recited in amended claim 1.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP 11-307791, herein referred to as JP '791, in view of Yamagishi et al. (U.S. Pat. No. 6,300,556).

Regarding claim 1, JP '791 disclose a solar cell module comprising a solar cell **1** encapsulated within a sealing resin **2**, and having a glass front surface side light transmitting member **3** and a resin film rear surface member **4** (fig. 1). The solar cell **1** comprises a crystalline silicon substrate **11** and has amorphous silicon semiconductor layers **12**, **13**, **16** and **17** formed thereon (fig. 2). The solar cell **1** also has two transparent electrodes **14** and **18** on the top and bottom surfaces (fig. 2). These

electrodes allow light to enter from both the front and rear surfaces of the solar cell module (fig. 1).

Regarding claim 2, light is incident from both sides of the solar cell (fig. 1).

Regarding claim 3, the front surface side light transmitting member **3** is glass (see English abstract).

Regarding claims 4 and 5, the rear surface member is formed of a transparent resin film (PET) (see figure 1 and paragraph [0025]).

Regarding claim 6, the solar cell element is a single crystalline silicon semiconductor having an n-type conductivity (paragraph [0024]).

Regarding claim 7, the solar cell element **1** comprises four amorphous semiconductor layers **12**, **13**, **16** and **17** (fig. 2).

Regarding claim 8, the solar cell **1** has a heterojunction between the amorphous silicon layers and the crystalline semiconductor (fig. 2).

The solar cell module of JP '791 differs from the instant invention because JP '791 does not disclose that the front surface side light transmitting member contains sodium, as recited in claim 1.

Regarding claim 1, Yamagishi et al. disclose the use of soda lime glass, which contains sodium, as a surface member (col. 7, line 29). Soda lime glass is a conventional glass used in solar cell modules because it is inexpensive.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the solar cell module of JP '791 to use soda lime

glass as the front surface member, as taught by Yamagishi et al., because soda lime glass is very inexpensive and provides excellent weather resistance.

Regarding the process steps recited in claim 6, JP '791 teaches all of the structural limitations recited in the claim. In product-by-process claims, patentability is determined is based on the product itself (see MPEP §2113).

4. Claims 1-5, 7 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hanoka et al. (U.S. Pat. No. 6,353,042) in view of Yamagishi et al. (U.S. Pat. No. 6,300,556) and in view of JP 11-307791.

Hanoka et al. disclose a solar cell module having a plurality of solar cells **22** encapsulated within a sealing material **10** (fig. 2). A front surface light transmitting member **26** is made of glass, and a rear surface member **28** is made of glass or a resin, such as Tedlar™, a transparent film (col. 5, line 65 to col. 6, line 9). A transparent film would allow light to enter from both sides of the solar cell. The solar cells **22** may comprise crystalline or amorphous material and may be made of silicon or one of several other semiconductor materials (col. 1, lines 31-35; col. 6, lines 19-59). Hanoka et al. specifically disclose a module as shown in figure 2, "a solar cell module **20** in which the encapsulant material **10** encapsulates interconnected crystalline silicon solar cells **22**" (col. 5, lines 55-57). Hanoka et al. is silent on the details of the junction within the crystalline silicon solar cells **22**.

The solar cell module disclosed by Hanoka et al. differs from the instant invention because Hanoka et al. do not disclose the following:

a. The front surface member containing sodium, as recited in claim 1;

b. The solar cell having a p- or n-type crystalline silicon substrate and an n- or p-type semiconductor layer formed on the substrate, as recited in claim 1;

c. The crystalline substrate is positioned on a side of the front surface side light transmitting member and the semiconductor layer is positioned on a side of the rear surface side member, as recited in claim 1; and

d. The solar cell element includes a heterojunction between a crystalline semiconductor and an amorphous semiconductor, as recited in claim 8.

Regarding claim 1, Yamagishi et al. disclose the use of soda lime glass, which contains sodium, as a surface member (col. 7, line 29). Soda lime glass is a conventional glass used in solar cell modules because it is inexpensive.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the solar cell module of Hanoka et al. to use soda lime glass as the front surface member, as taught by Yamagishi et al., because soda lime glass is very inexpensive and provides excellent weather resistance.

Regarding claims 1 and 8, JP '791 disclose a solar cell module comprising a solar cell **1** encapsulated within a sealing resin **2**, and having a glass front surface side light transmitting member **3** and a resin film rear surface member **4** (fig. 1). The solar cell **1** comprises a crystalline silicon substrate **11** and has amorphous silicon

semiconductor layers **12**, **13**, **16** and **17** formed thereon (fig. 2). The solar cell **1** also has two transparent electrodes **14** and **18** on the top and bottom surfaces (fig. 2). These electrodes allow light to enter from both the front and rear surfaces of the solar cell module (fig. 1).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the solar cell module of Hanoka et al. to use a crystalline silicon substrate and an amorphous layer forming a heterojunction, as taught by JP '791, because the solar cell of JP '791 efficiently utilizes all of the light incident on both sides of the solar cell.

5. Claims 1-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hanoka et al. (U.S. Pat. No. 6,353,042) in view of Yamagishi et al. (U.S. Pat. No. 6,300,556), in view of Nakagawa et al. (U.S. Pat. No. 5,858,120) and in view of JP 11-307791.

Hanoka et al. disclose a solar cell module having a plurality of solar cells **22** encapsulated within a sealing material **10** (fig. 2). A front surface light transmitting member **26** is made of glass, and a rear surface member **28** is made of glass or a resin, such as Tedlar™, a transparent film (col. 5, line 65 to col. 6, line 9). A transparent film would allow light to enter from both sides of the solar cell. The solar cells **22** may comprise crystalline or amorphous material and may be made of silicon or one of several other semiconductor materials (col. 1, lines 31-35; col. 6, lines 19-59). Hanoka et al. specifically disclose a module as shown in figure 2, "a solar cell module **20** in

which the encapsulant material **10** encapsulates interconnected crystalline silicon solar cells **22**" (col. 5, lines 55-57). Hanoka et al. is silent on the details of the junction within the crystalline silicon solar cells **22**.

The solar cell module disclosed by Hanoka et al. differs from the instant invention because Hanoka et al. do not disclose the following:

a. The front surface member containing sodium, as recited in claim 1;

b. The solar cell having a p- or n-type crystalline silicon substrate and an n- or p-type semiconductor layer formed on the substrate, as recited in claim 1;

c. The crystalline substrate is positioned on a side of the front surface side light transmitting member and the semiconductor layer is positioned on a side of the rear surface side member, as recited in claim 1; and

d. The solar cell element is a single crystalline silicon solar cell element formed by doping impurities in the p-type or n-type substrate, as recited in claim 6.

Regarding claim 1, Yamagishi et al. disclose the use of soda lime glass, which contains sodium, as a surface member (col. 7, line 29). Soda lime glass is a conventional glass used in solar cell modules because it is inexpensive.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the solar cell module of Hanoka et al. to use soda

lime glass as the front surface member, as taught by Yamagishi et al., because soda lime glass is very inexpensive and provides excellent weather resistance.

Regarding claims 1 and 8, JP '791 disclose a solar cell module comprising a solar cell **1** encapsulated within a sealing resin **2**, and having a glass front surface side light transmitting member **3** and a resin film rear surface member **4** (fig. 1). The solar cell **1** comprises a crystalline silicon substrate **11** and has amorphous silicon semiconductor layers **12**, **13**, **16** and **17** formed thereon (fig. 2). The solar cell **1** also has two transparent electrodes **14** and **18** on the top and bottom surfaces (fig. 2). These electrodes allow light to enter from both the front and rear surfaces of the solar cell module (fig. 1).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the solar cell module of Hanoka et al. to use a crystalline silicon substrate and an amorphous layer forming a heterojunction, as taught by JP '791, because the solar cell of JP '791 efficiently utilizes all of the light incident on both sides of the solar cell.

Regarding claim 6, Nakagawa et al. disclose a method for forming a crystalline solar cell element, wherein a single crystalline silicon wafer, which is p-type, is doped by heat diffusion to create an n-type layer on the single crystalline substrate (col. 13, lines 36-46). Single crystalline silicon has a higher conversion efficiency than amorphous or polycrystalline silicon.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the crystalline silicon solar cell in the device of Hanoka et al. to use a single crystalline silicon substrate that is doped by heat diffusion, as taught by Nakagawa et al. because single crystalline has a high conversion efficiency.

6. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hanoka et al. (U.S. Pat. No. 6,353,042) in view of Yamagishi et al. (U.S. Pat. No. 6,300,556) and in view of JP 11-307791, as applied above to claims 1-5, 7 and 8, and further in view of Matsushita et al. (U.S. Pat. No. 6,222,118).

Hanoka et al., Yamagishi et al. and JP '791 describe a solar cell module having the limitations of claims 1-5, 7 and 8 of the instant invention, as explained above in section 4. However, they do not disclose the use of single crystalline silicon solar cell elements as claimed in the instant invention.

Matsushita et al. teach the use of single crystalline silicon solar cell elements (col. 4, line 53). Matsushita et al. also teach that polycrystalline silicon, amorphous silicon, or combinations of both can equally be used in solar cell elements (col. 8, line 63).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have made the solar cell modules described by Hanoka et al., Yamagishi et al. and JP '791 to use a single crystalline silicon layer because single

crystalline layers, amorphous layers and polycrystalline layers are equally usable in solar cell modules, as taught by Matsushita et al. (col. 8, line 63).

Response to Arguments

7. Applicant's arguments with respect to claims 1-8 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

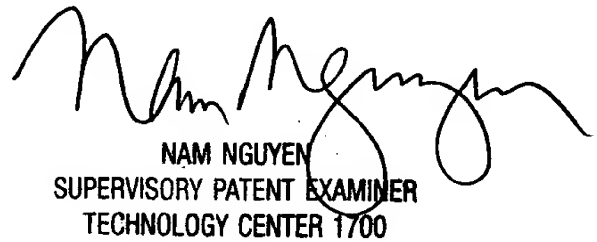
A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brian L. Mutschler whose telephone number is (703)

305-0180. The examiner can normally be reached on Monday-Friday from 8:00am to 4:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on (703) 308-3322. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.



NAM NGUYEN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700

blm
August 12, 2003